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Mapping nanotechnology patents: The EPO approach

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Abstract

As a consequence of large public and private investments in new technologies at the nanoscale, an increase in the filing numbers of European and PCT patent applications related to nanotechnology is expected at the European Patent Office (EPO) in the coming years. A strategy has been devised to prepare the EPO for potential impacts this interdisciplinary emerging technology might have on workload per technical field, classification and search. A part of the strategy has been to create an internal working group on nanotechnology (NTWG) of patent examiners from different technical fields reflecting the interdisciplinary nature of this 'size' defined emerging field. First results of this NTWG are agreement within the EPO on a definition of nanotechnology and the creation of the corresponding tagging system Y01N which enables the monitoring of the evolution of patenting trends in this area of technology. The tags overcome the intrinsic difficulties in retrieving relevant patent publications from the huge amount of information contained in the EPO's patent databases. In addition it is expected that access to Y01N via esp@cenet terms will simplify prior art search of nanotechnology patents and will support strategic decision making for economists, investors or funding agencies in nanotechnology.

Keywords: Nanotechnology; Nanobiotechnology; Nanooptics; Nanomagnetics; EPO examiners; ECLA; Tagging; Y01N; Interdisciplinary searches; Patent trends

1. Introduction

Emerging technologies with high growth rates can have a considerable impact on the EPO, as the examples of biotechnology and telecommunication have shown in the past. The explosive growth in patent applications in the nineties in these fields has put severe challenges to workload management and examiner recruitment in patent offices worldwide.

With this in mind, the EPO is developing strategies to be prepared for emerging technologies at an early stage in order to ensure that sufficient examiners with relevant technical and legal competence are available in areas with a strong increase in patent filings. In this way, the EPO can ensure that the best service possible is delivered, i.e., that high quality patents are granted in a reasonable time frame in order to reduce legal uncertainty for the applicants and to avoid unduly broad patent claims that could hamper the development of entire technical areas.

In 2004, about € 8 billion [1] were dedicated to investments in nanotechnology research and development, both by private and public sources (e.g., the 6th and 7th framework programme of the EU [2], the US national nanotechnology initiative [3]). In fact, nanotechnology is considered by many as one of the key technologies of this century with an expected market volume of one trillion dollars in 2015 [4]. It is likely that these R&D research efforts will yield an increasing number of nanotechnology related patent applications.

Nanotechnology is a technology at the atomic scale where the distinctions between quantum physics, molecular chemistry, material science and biotechnology become less relevant. This interdisciplinary nature poses specific challenges to patent offices since nanotechnology patents are

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Table 1
Some nanotechnology definitions

Source	Definition
IPC subclass B82B	'Nanostructure' is 'an atomically precise arrangement of matter having particularly shaped configuration including at least one essential integral element that: (i) is formed solely from an atom, a molecule or an extremely limited collection of atoms or molecules, which collection in its entirety is undetectable by an optical microscope; and (ii) has been formed by having its atoms or molecules individually manipulated as discrete units during its manufacture'
physics.about.com [11]	'The development and use of devices that have a size of only a few nanometres'
hyperdictionary.com [12]	'The branch of engineering that deals with things smaller than 100 nm (especially with the manipulation of individual molecules)'
NASA [13]	'Nanotechnology is the creation of functional materials, devices and systems through control of matter on the nanometer length scale (1–100 nm), and exploitation of novel phenomena and properties (physical, chemical, biological, mechanical, electrical...) at that length scale'
C. Joachim, Nature materials [14]	'Nanoscience should be reserved solely for the study of a single atom or a single molecule, that is, of one entity at a time, and not for groups of such entities where statistics or interactions between them come into play'
Royal society of London [15]	'Nanoscience is the study of phenomena and manipulation of materials at atomic, molecular and macromolecular scales, where properties differ significantly from those at a larger scale'
National nanotechnology Initiative [3]	'Nanotechnology is the understanding and control of matter at dimensions of roughly 1–100 nm, where unique phenomena enable novel applications'
German federal ministry of education and research [16]	'Nanotechnology refers to the creation, investigation and application of structures, molecular materials, internal interfaces or surfaces with at least one critical dimension or with manufacturing tolerances of (typically) less than 100 nm. The decisive factor is that the very nanoscale of the system components result in new functionalities and properties for improving products or developing new products and applications. These novel effects and possibilities result mainly from the ratio of surface atoms to bulk atoms and from the quantum-mechanical behaviour of the building blocks of matter'

filed for different, overlapping areas of technology. Hence it is important to monitor the growth of nanotechnology patents per technical area and the interdisciplinary overlap in order to address important issue such as search-file allocation, multidisciplinary classification schemes, efficient and complete prior art searches, substantive examination and examiner recruitment. It is not an easy task to identify nanotechnology patents. Some studies on scientific articles and patents on nanotechnology have already been performed in the past [5–7], and provide conclusions of a general nature.

To address the specific issues relevant to patent offices, the EPO, the USPTO [8] and the JPTO [9] have undertaken efforts to monitor nanotechnology patent trends in detail.

In this paper we present first results from the EPO with respect to the ongoing process of identifying and tagging nanotechnology based patents as well as data showing the current patent trends in different technological areas. Furthermore, the methodology for creating an EPO in-house monitoring and multidisciplinary tagging code Y01N for nanotechnology patents as part of this strategy is outlined.

2. The EPO definition of nanotechnology

2.1. General view on defining nanotechnology

Table 1 shows an overview of some definitions of nanotechnology as used by the scientific community, funding agencies and the intellectual property world. Definitions range from very narrow definitions (e.g., IPC[1] and ECLA[2] class B82) to very broad definitions including all submicrometer technologies. A survey of opinions of European researchers [10] also confirms a lack of consensus on what exactly nanotechnology is.

For example, some mature technologies that fall within the scope of many nanotechnology definitions are by many experts not considered as nanotechnology. One example of such a technology is zeolite synthesis. Zeolites are crystalline materials with a very regular pore system of channels with a diameter generally in the range of 0.3–0.9 nm. They are synthesized using a method of self-assembly around template molecules. Their very well-defined pore system with channels of molecular dimensions provides them with unique properties in catalysis and separation technologies. They are also referred to as 'molecular sieves'. Probably because the synthesis of zeolites and their large scale industrial use is a mature technology which started in the 1950s it is generally not labelled a nanotechnology, although one can assume that it would be called nanotechnology if it were invented today.

In 2003 the EPO created a nanotechnology working group (NTWG) with the aim of confronting the challenges posed by nanotechnology. The first task of the NTWG was to find an EPO nanotechnology definition for trend watching nanotechnology patents and the facilitation of interdisciplinary search. Such a definition had to match closely the

[1] International patent classification.
[2] European classification.